भारतीय मानक
Indian Standard

IS 16484 : 2017
(Reaffirmed 2022)

द्रवित पेट्रोलियम गैस के गैस सिलिंडर या टैंक (मोबाइल या स्थिर) के लिए द्रव औफटेक वाल्व — विशिष्ट

Liquid Off – Take Valve Fitting to Gas Cylinders or Tanks (Mobile or Static) for Liquid Petroleum Gas (LPG) — Specification

ICS 23.020.30

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May 2017 **Price Group 8**

Gas Cylinders Sectional Committee, MED 16

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Gas Cylinders Sectional Committee had been approved by the Mechanical Engineering Division Council.

This standard specifies the requirements of material, design and testing of liquid off-take valve fitting to gas cylinders or tanks (Mobile or Static) of more than 75 litre water capacity, for liquid petroleum gas (LPG). It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

While implementing this standard, the manufacturer and the inspection agency shall ensure compliance with statutory regulations.

In the formulation of this standard, assistance has been derived from the following standards:

IS 8737:1995	Valve fittings for use with liquefied petroleum gas (LPG) Cylinders of more than 5 litre water capacity
ISO 15995:2006	Gas cylinders — Specifications and testing of LPG cylinder valves — Manually operated
EN 13175:2003	Specification and testing for Liquefied Petroleum Gas (LPG) tank valves and fitting.
ANSI/CGA V-1	Compressed gas cylinders valve outlet and inlet connections, issued by American Standards Institute.

The composition of the Committee responsible for the formulation of this standard is given in Annex E.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

LIQUID OFF – TAKE VALVE FITTING TO GAS CYLINDERS OR TANKS (MOBILE OR STATIC) FOR LIQUID PETROLEUM GAS (LPG) — SPECIFICATION

1 SCOPE

This standard covers the specification of material, design and testing of liquid off-take valve fitting to gas cylinders or tanks (Mobile or Static) of more than 75 litre water capacity, for liquid petroleum gas (LPG). It covers valve with taper stems only.

2 REFERENCES

The standards listed in Annex A contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate possibility of applying the most recent editions of the standards listed in Annex A.

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 7241 and the following shall apply.

3.1 LPG — Mixture of light hydrocarbons, gaseous under standard atmospheric conditions, which can be liquefied by, increased pressure or decreased temperature. The main components are propane, butane and butane isomers.

3.2 Liquid Off Take Valve — Valve designed to allow liquid withdrawal from a cylinders and liquid filling in cylinders in its normal operating position.

3.3 Manually Operating Valve — A device operated by hand for closing or modifying the flow passage to stop, allow or control the flow.

3.4 Poppet Valve — Self-closing, spring-loaded valve that provides leak tight seal and opens by the engagement of a special connecter or by fluid passing through it. It closed automatically upon removal of the connector or by stopping the fluid flow.

3.5 Excess Flow Valve — Valve designed to close automatically with a small residual flow, when the fluid flow passing through it exceeds a predetermined value, and to reopen when the pressure differential across the valve has been restored below a certain value.

3.6 Residual Flow — Deliberately allowable flow past the seat of an excess flow valve when the valve is in the closed position.

3.7 Liquid Withdrawl Tube (also called Eduction Tube) — A tube fitted to the inlet of a valve to permit withdrawal of liquid LPG under vapour pressure, from a cylinder or tank in its normal operating position.

3.8 Safety Relief Valve — A device which automatically, only by use of LPG vapour energy, discharges a quantity of the vapour to prevent a predetermined safe pressure being exceeded and which is designed to re-close and prevent further flow of the vapour after a predetermined safe pressure is reached.

3.9 Nominal Set Pressure — The nominal pressure marked on the valve body at which the valve is set and specified to start to discharge.

3.10 Flow Rating Pressure — The pressure at the inlet of a safety relief valve, which is used for establishing its rated flow capacity (normal 120 percent of start to discharge pressure).

3.11 Certified Discharge Capacity — The discharge capacity permitted to be used as a basis for the application of the safety relief valve quote, in cubic metre of free air at standard temperature and pressure.

3.12 Leak — An unintended flow of gas in excess of 4 Nmm^3/s.

4 MATERIAL

4.1 All component used in valve construction shall be made of material compatible with LPG and with the valve material of the cylinders. The material of the valve body shall comply with the properties given in **4.2, 4.3** and **4.4.**

4.1.1 Brass components of the valve shall be subjected to mercurous nitrate test in accordance with IS 2305. The sample shall show no sign of cracking after the test.

4.2 Valve bodies made from forged copper alloys shall be manufactured from materials in accordance with recognized standards such as IS 8737.

4.2.1 *Chemical Composition*

The chemical composition of brass alloy shall have the following elements and composition.

Element	*Composition percent*
Copper (cu)	56.5 to 60 percent
Lead (Pb)	1.0 to 2.0
Iron (Fe)	0.3 *Max*
Manganese (Mn)	0.5 *Min*
Others	0.75 *Max* (inclusive of iron)
Zinc	Remainder

4.2.2 *Tensile Strength and Elongation*

4.2.2.1 The tensile strength and elongation of the material of valve body determined according to IS 1608 shall be at least 392 Mpa (40 kgf/nm^2) and 18 percent measured on a gauge length $5.65\sqrt{S_o}$. S_o being the original area of cross-section.

4.2.2.2 *Cross-section*

During the tensile test, if a specimen breaks outside the gauge length and has not registered elongation mentioned under **4.2.2.1** the specimen shall be ignored and not treated as having failed and another sample taken.

4.2.3 *Impact Strength*

The izod impact strength of the material of valve body determined according to IS 1598 or other applicable specifications shall not be less than 21.5 Nm (2.2 kg.m).

4.2.4 *Test Samples*

Test samples for tensile and izod impact tests shall, where practicable, be taken from a valve body blank; where this is not practicable, the test samples shall be made from the same raw material (wrought or extruded section) giving the same outside shape as the valve body blanks it represents. The scale of sampling and criteria for conformity shall be in accordance with the requirements of Annex B. Unless otherwise agreed to between the manufacturer and the purchaser.

4.3 Non-Metallic Materials

4.3.1 All rubber and other moulded parts coming in contact with LPG in the construction of the valve shall be compatible with LPG, When tested according to IS 9798. After this test, change in hardness value from before to after the test shall be within ±10 IRHD. All rubber and other moulded parts shall be suitable for external climatic conditions in which the valve is likely to used, the range of temperature being –20°C to +65°C.

4.3.2 Rubber material shall be free from porosity, pits and foreign particles and shall have a smooth non-tacky surface with minimum talc or bloom. The material shall have low compression set, cold flow and creep characteristic.

4.3.3 The rubber material shall not show change of more than 10 IRHD when subjected to ageing of 72 h at 70°C in accordance with the method prescribed under **3** or **4** of IS 3400 (Part 4).

4.3.4 The nitrile rubber material shall be subjected to compression set in accordance with IS 3400 (Part 10) maximum – set observed shall be as specified below:

Test Condition	*Compression Set,* percent
Compression 25 percent at 20°C for 24 h	10 *Max*
Compression 25 percent at 100°C for 24 h	20 *Max*

4.3.5 *Ozone Ageing Test* (Where the Material is Exposed to the Atmosphere)

The test shall be carried out in accordance with IS 3400 (Part 20). The test piece which has to be stressed to 20 percent elongation, shall be exposed to air at 40°C, relative humidity <65 percent, with an ozone concentration of 50 parts per hundred million during 72 h. There shall be no cracks on the test pieces.

4.3.6 The valve pad fitted in SRV packing holder shall be immersed in commercial LPG in the vapour phase for 70 h after which the pad shall not show evidence of being forced out of position due to swelling or other cause.

4.4 Springs

Springs shall be corrosion resistance conforming to IS 4454 (Part 4).

5 SCREW THREADS ON THE VALVE STEM AND CYLINDER NECK (VALVE INLET THREADS)

5.1 The valve inlet shall be provided with any of the three types of taper screw threads specified in **5.1.1** or **5.1.2** or **5.1.3**.

5.1.1 *Type 1 Threads*

The valve inlet shall have at taper of 1 in 16 on diameters. The basic threads form, the principal dimensions and limits on crest and root truncation are shown in Figs. 1, 2 and 3, respectively. The threads checking shall be carried out according to Annex A of IS 15894.

NOTE — This type of threads also conforms to threads size ¾½-14 NGT of ANSI/CGAV-1-1987.

5.1.1.1 *Limits on size*

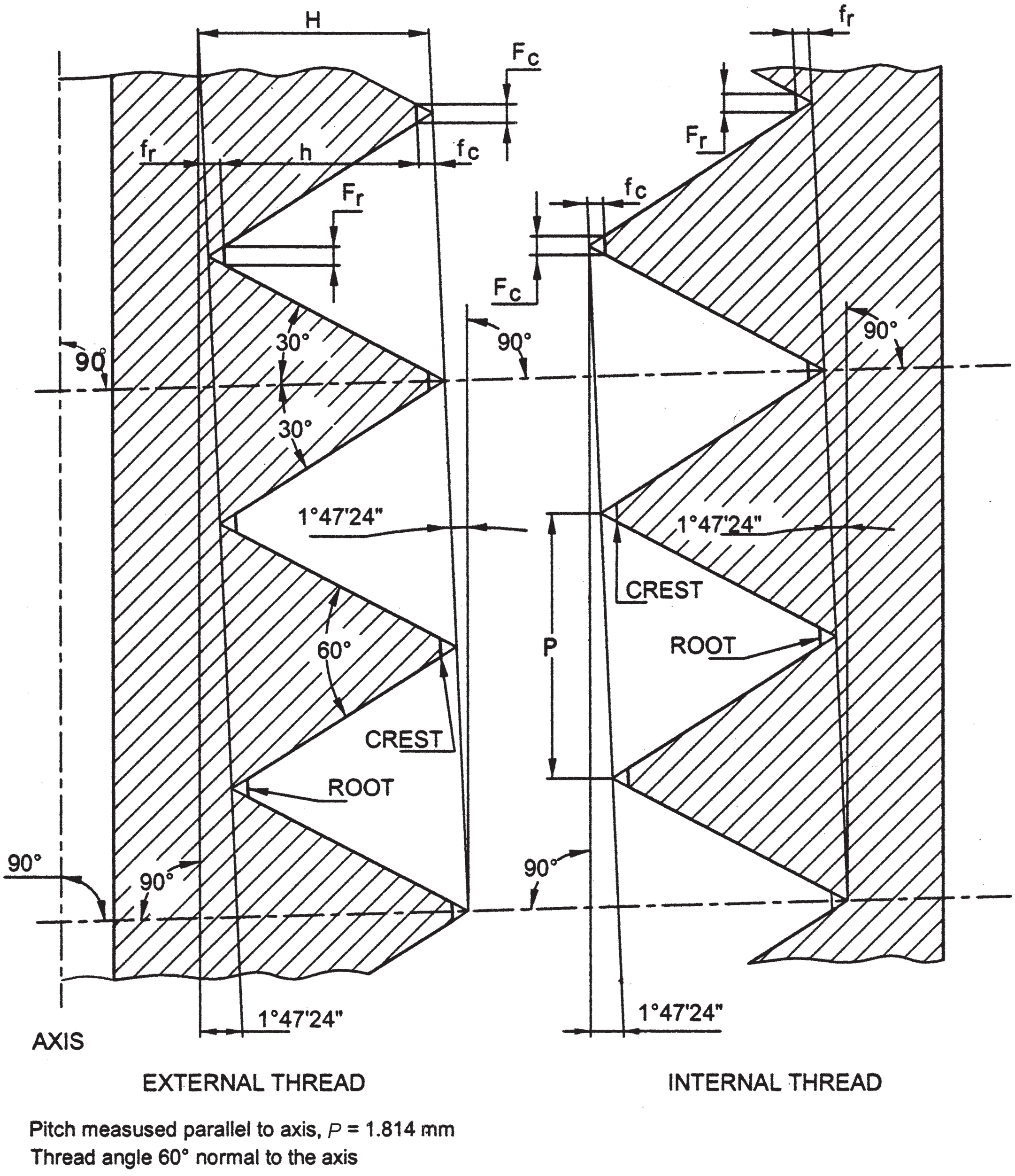
Final inspection limits on size (pitch diameter) of both external and internal threads are ±1 turn from basic, although the preferred working limits are ± ½ turn from basic.

5.1.1.2 *Limits on taper*

a) The taper on the pitch element of external threads shall be 1 in 16 on diameters, with a minus tolerance of 1 turn, but no plus tolerance in gauging.

b) The taper on pitch element of internal threads shall be 1 in 16 on diameters, with a plus tolerance of 1 turn, but no minus tolerance in gauging.

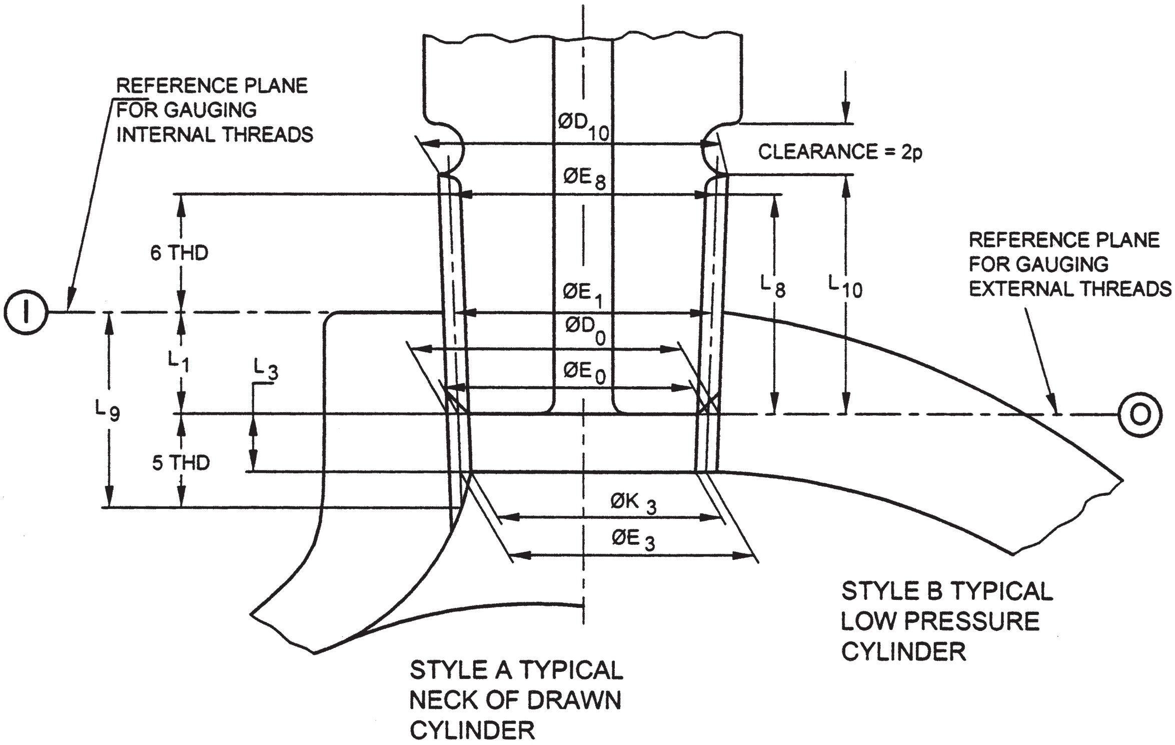
5.1.1.3 The tolerance on 60° angle of threads shall be ±2°.



Pitch measused parallel to axis, P = 1.814 mm
Thread angle 60° normal to the axis
Taper 1 in 16 measured on the diameter along the axis
H = 0.866 025 P - height of 60° sharp V thread = 1.571 22 mm
h = 0.800 000 P = height of thread on product = 1.451 43 mm
f_c = depth of truncation at crest , f_e = depth of truncation at root
F_c = width of flat at crest, F_r = width of flat at root

NOTE — The thread is same as 3/4" - 14 National Gas Taper (NGT) threads of ANSI/CGA .

FIG. 1 BASIC THREAD FORM OF TYPE 1 TAPER SCREW THREADS


REFERENCE PLANE FOR GAUGING INTERNAL THREADS
ØD10
CLEARANCE = 2p
ØE8
6 THD
L8
L10
REFERENCE PLANE FOR GAUGING EXTERNAL THREADS
I
ØE1
ØD0
L1
L3
ØE0
L9
O
5 THD
ØK3
ØE3
STYLE B TYPICAL LOW PRESSURE CYLINDER
STYLE A TYPICAL NECK OF DRAWN CYLINDER

D = Major diameter
D_0 = 26.03
D_{10} = 27.45
E = Pitch diameter
E_0 = 24.58
E_1 = 25.118
E_3 = 24.24
E_8 = 25.798
K = Minor diameter
K_3 = 22.79

L_1 = Standard handtight engagement
= 8.611
L_3 = 3 Threads (for wrenching)
$L_1 + L_3$ = 14.05
L_8 = Length of full external threads
= 19.497
L_9 = Length of full roots (minimum) on internal threads
= 17.681
L_{10} = Length of full roots (minimum) on internal threads
= 23
Diameter at small end of the valve after chamfer = 23

All dimensions in millimetres.

FIG. 2 DIMENSIONS FOR TYPE 1 TAPER SCREW THREADS ON VALVE STEMS AND CYLINDER NECKS

5.1.1.4 The tolerance on lead in the length of effective threads shall be ±0.076 2 mm valid for any size threaded to an effective thread length greater than 25.4 mm.

5.1.1.5 The minimum taper on pitch line per millimeter shall be 0.072 9 and minimum 0.052.

5.1.2 *Type 4 Threads*

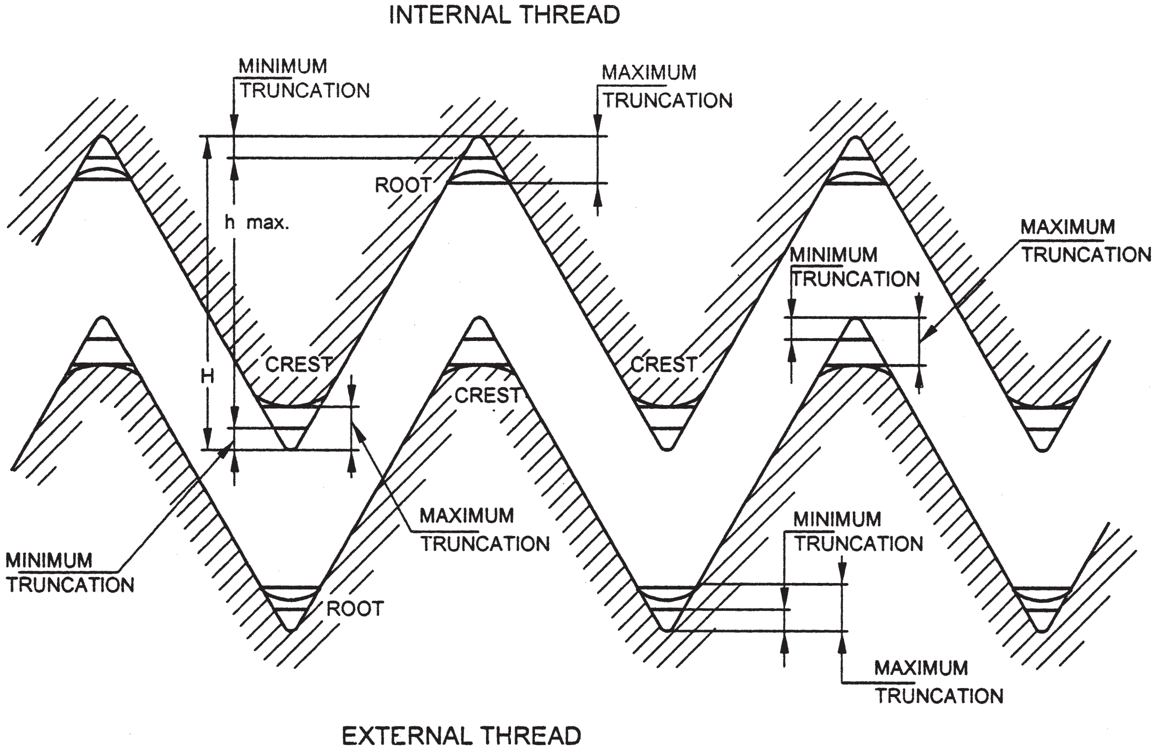
The valve inlet shall have taper of 1 in 8 on diameter. The basic form principal dimensions and their limits are given in Fig. 4 and Table 1. Threads checking shall be carried out according to IS 7202.

5.1.3 *Type 2 Threads*

Type 2 threads with a taper 3 in 25 on diameter and a nominal size 28.8 mm. The basic form, principal dimensions and their limits are given in Fig. 5(a), Fig. 5(b), and Table 2.

6 VALVE OUTLET CONNECTION

Valve outlet threads shall be as per Fig. 6.



p = Pitch = 1.814

H = Height of sharp V thread = 0.866 025 p = 1.571 22

h = Height of thread on product = 1.454 4 *Max*
= 1.288 0 *Min*

f = Truncation on crest and root
f_{min} = 0.033 p = 0.059 87
f_{max} = 0.078 p = 0.141 51
Tolerance = 0.0816

F = Equivalent width of flat
F_{min} = 0.038 p = 0.068 94
F_{max} = 0.090 p = 0.163 29
Tolerance = 0.094 35

All dimensions in millimetres.

FIG. 3 LIMITS ON CREST AND ROOT TRUNCATION OF TYPE 1 TAPER SCREW THREADS

7 MINIMUM CONSTRUCTIONAL REQUIREMENT

7.1 All the valves shall have taper inlet threads only.

7.2 Valve outlet may be at any angle easily accessible for connection.

7.3 If the valve body is made of more than one part, precautions shall be taken to ensure that there can be no unintentional dismantling. Disassembly shall require specialized equipment. Poppet type spring loaded self closing valve shall be incorporated at outlet of valve.

7.4 Outlet threads shall be provided with safety cap made of high-grade unbreakable plastic to prevent damage to threads and leakage of gas.

7.5 Valve is hand wheel operated, so the spindle shall close the valve by clockwise rotation and open by anti-clockwise rotation. In addition, hand wheel shall be clearly marked with 'open' and 'close' directions in words and by arrow to indicate result of rotation.

7.6 Excess Flow Check Valve

Excess flow check valve is required at the bottom inlet side of the valve at top of liquid with drawl tube.

NOTE — The EFCV shall not interfere with the normal operation and the functioning of the safety/pressure relief valve.

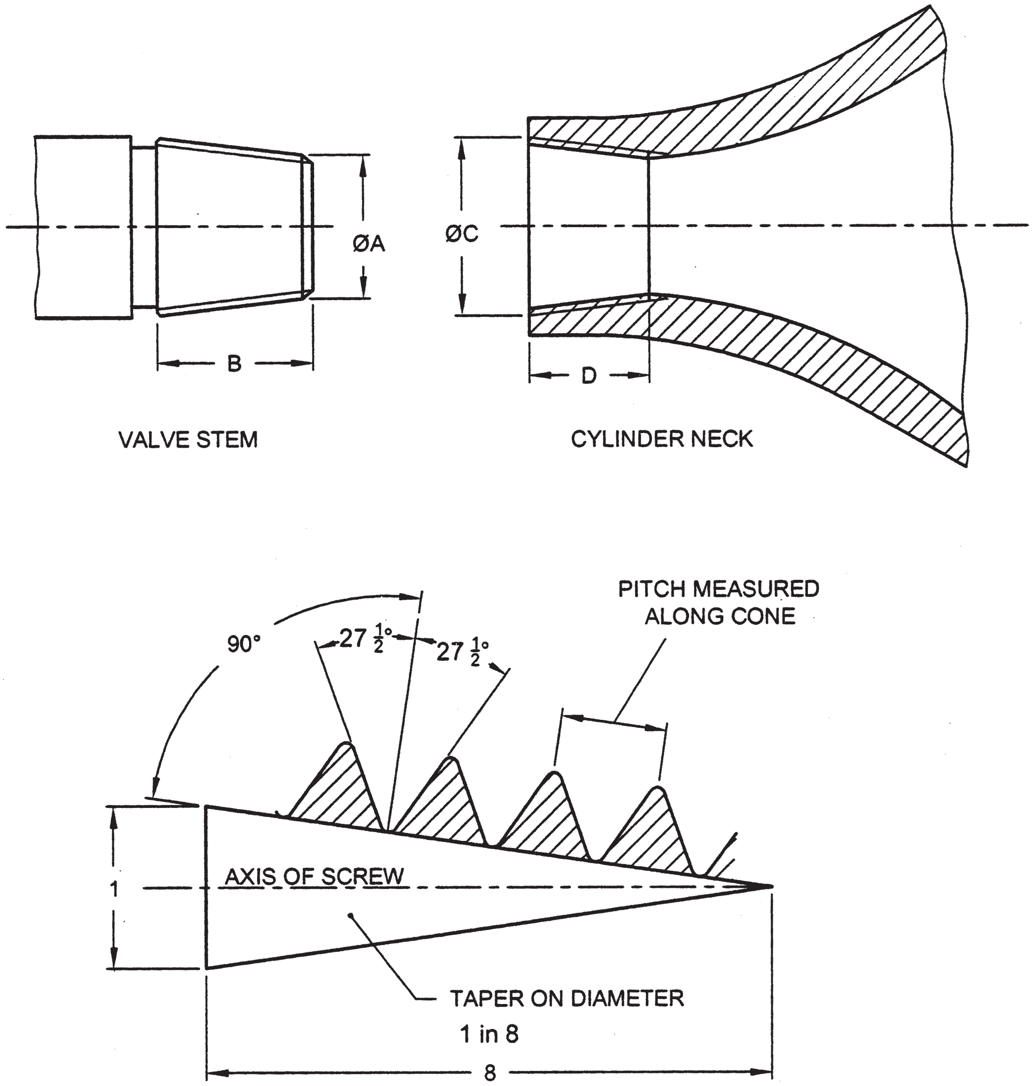
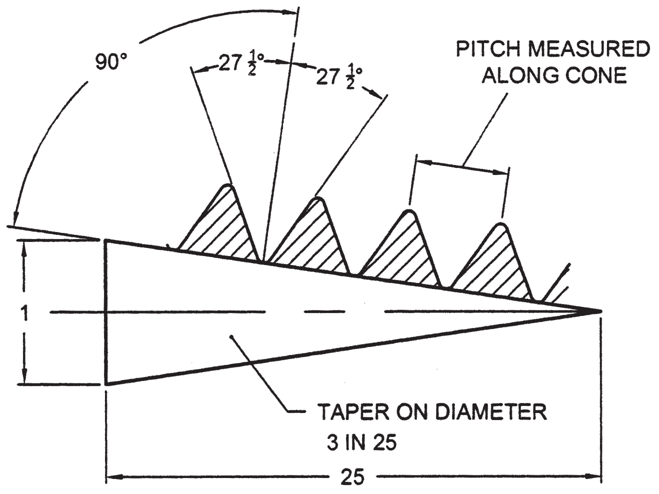


FIG. 4 FORM OF THREAD DIMENSIONS OF TYPE 4 SCREW THREADS OF NOMINAL SIZE 25.4 mm ON VALUE STEMS AND IN CYLINDER NECKS

Table 1 Principal Dimensions and Limits for Type 4 Taper Screw Threads of Nominal Size 25.4 Mm

(*Clause* 5.1.2 *and* Fig. 4)

Sl No. (1)	Form of Threads (2)	Whit Worth, Right-Hand, Normal to the Surface of Cone, Threads Ang (3)	
i)	Nominal size of valve thread	25.4 mm	
	a) Taper on diameter	1 in 8	
	b) Pitch measured along cone	1.814 mm	
ii)	Diameter of threads on valve stem at small end, 'A':	Maximum	Minimum
	a) Major Diameter	25.400	25.197
	b) Pitch Diameter	24.327	24.102
	c) Minor Diameter	23.073	22.802
iii)	Diameter of threads at mouth of cylinder, 'C':	Maximum	Minimum
	a) Major Diameter	28.059	27.788
	b) Pitch Diameter	26.759	26.624
	c) Minor Diameter	25.664	25.461
iv)	Length of thread 'B'	$25.4^{3.17}_{-0}$	
v)	Length of engagement	19.05 *Min*	
vi)	Length of thread in cylinder neck, 'D'	25.4 mm *Min*	



Pitch -1.814 mm Angle - 55° Taper - 3 in 25 on Diameter

5A Basic Thread Form of Type 2 Thread, Right Hand Normal to Surface Cone

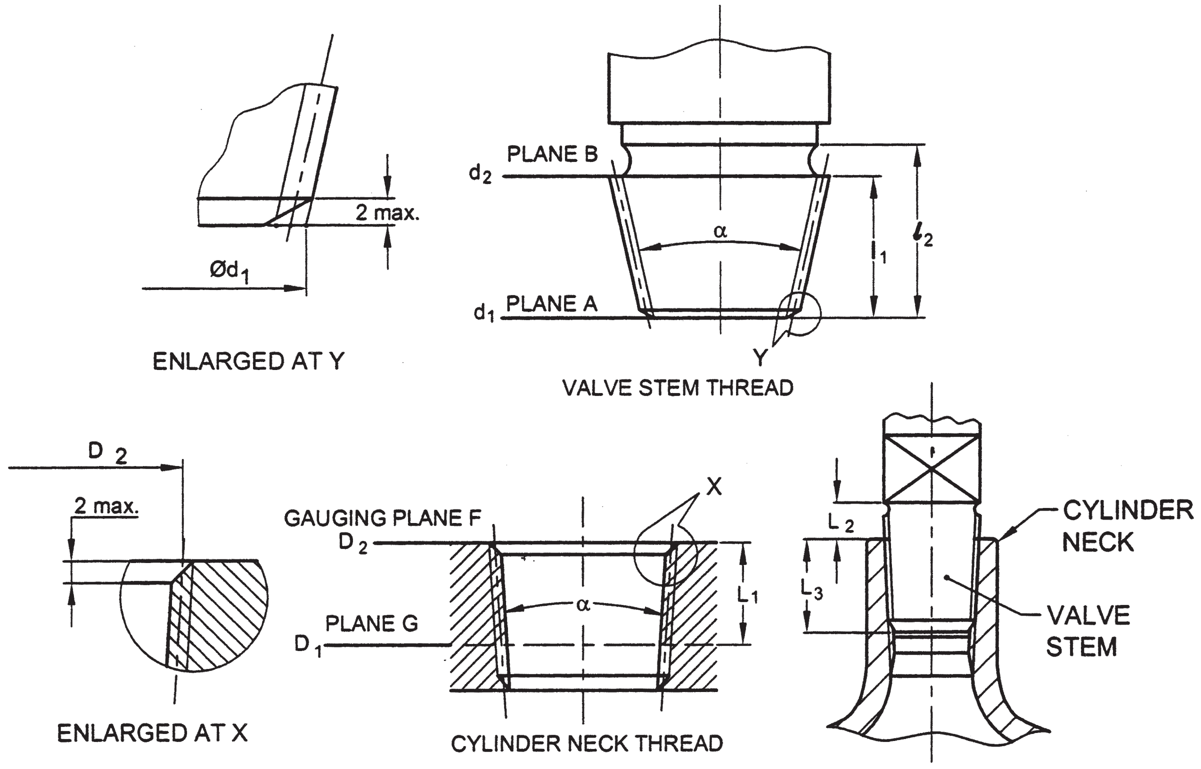


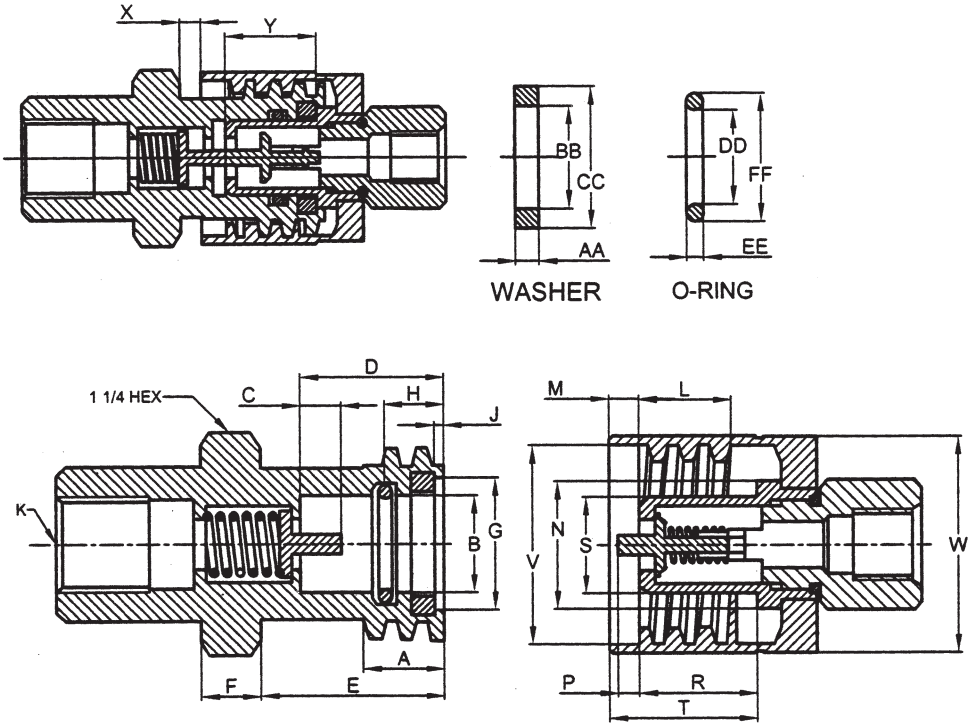
Table 2 Basic form, principal dimensions and their limits

NORMAL DIAMETER OF VALVE	VALVE INLET THREAD			THREAD IN CYLINDER NECK		LENGTH OF THREAD AT THEORITICAL THREAD DIMENSIONS	
	d_2 + 0.12	d_1 + 0.12	l_1	D_2 - 0.12	L_1 min.	L_2	L_3
28.8	28.8	25.68	26	27.8	22	8.33	17.67

All dimensions in millimetres.

5B Principal Dimensions for Type 2 Taper Threads on Valve Stem and in Cylinder Neck

NOTE — This type of thread also conforms to thread size of 28.8 mm of DIN 477 -1963 sheet 1. 'Specification of gas cylinder valves types, size, and connections threads issued by the DIN DEUTSHC Institute fiir Normung.Also conforms to Type 25 T of BS 341 Part 1: Type -2 Threads shall be inspected as per IS 9122.



VALVE OUTLET				NIPPLE & NUT ASSEMBLY			
THREAD	1.250-5 ACME-2G-RH-EXT			THREAD	1.250-5 ACME-2G-RH-INT (MOD)		
MAJOR DIA	1.2500-1.2400		(31.750-31.496)	MAJOR DIA	1.2700-1.2900		(32.258-32.766)
PITCH DIA	1.1411-1.1210		(28.984-28.473)	PITCH DIA	*1.1500-1.1740		(29.210-29.820)
MINOR DIA	.9998-1.0300		(25.395-26.162)	MINOR DIA	*1.0500-1.0950		(26.670-27.813)
FULL THREAD	*A	.520-.578	(13.21-14.68)	FULL THREAD	*L	.585-.800	(14.86-20.32)
BORE DIA	*B	.625-.635	(15.90-16.13)	C' BORE DEPTH	*M	.190-.266	(4.83-6.76)
PROBE EXT	*C	.214-.308	(5.44-7.82)	SHOULDER DIA	*N	.815-.849	(20.70-21.56)
GLAND DEPTH	*D	.925-1.025	(23.50-26.04)	PROBE EXT	*P	.015-.221	(0.38-5.61)
SHOULDER LENGTH	*E	1.172-1.220	(29.77-30.99)	NIPPLE LENGTH	*R	.755-.835	(19.18-21.21)
SHOULDER WIDTH	*F	.375±.015	(9.53-±0.38)	NIPPLE DIA	*S	.620-.624	(15.75-15.85)
C BORE DIA	*G	.850-.910	(21.58-23.11)	SHOULDER DEPTH	*T	.910-.970	(23.11-24.64)
O-RING GROOVE	*H	.297-.360	(7.54-9.14)	OUTLET THREAD	U	1/4 NPT	
WASHER DEPTH	*J	.056-.110	(1.42-2.79)	C BORE DIA	*V	1.280-1.300	(32.51-33.02)
INTET THREAD	K	3/8 NPT		NUT DIA	*W	1.406	(35.71) OPTIONAL

	WASHER				O-RING		
THICKNESS	*AA	.125-.155	(3.18-3.94)	INSIDE DIA	DD	.612	(15.54)
HOLE DIA	*BB	.655-.670	(16.64-17.02)	WIDTH	EE	.103±.003	(2.62±0.08)
DIAMETER	*CC	.910-.930	(23.11-23.62)	OUTSIDE DIA	FF	.8125(REF)	(20.64) (REF)

All dimensions in millimeters.

* The dimensions marked with an asterisk are not be used as design dimensions for the manufacture of this connection. These dimensions are composite or envelope dimensions as a result of the actual design dimensions. The actual design dimensions for this connection must be determined by the individual manufacturer and must be interchangeable with all other manufacturers of this connection, and be within the envelope dimensions on this page. It is the responsibility of each manufacturer of this connection to maintain interchangeability in the event they make any design changes.

FIG. 6 STANDARD CYLINDER VALVE OUTLET CONNECTION FOR PRESSURES UP TO 500 PSIG (3450 KPA) FOR GASEOUS AND LIQUID PROPANE (R290)

7.7 The general machining tolerance unless otherwise stated shall be of medium class specified in IS 2102 (Part 1).

7.8 The minimum finished wall thickness at any portion of the valve shall not be less than 2.5 mm. However, this requirement shall be related in the case of sections not susceptible to temper, and damage or rapture to section will not effect the sealing off, of the valve.

7.9 Safety Relief Valve

Safety relief valve shall be manufactured in accordance with IS 5903 and shall have uninterrupted contact with the vapor.

8 TYPE TEST

The test regime shall consist of tests numbers 1 to 27 in accordance with Table 3 Acceptance criteria shall be as detailed in **8.22**.

8.1 Hydraulic Pressure Test (Test No. 1)

Representative sample of valve shall be subjected to hydrostatic test at 1.5 times the maximum working pressure at which it is envisaged that valve will be used. Pressure relief valve shall be plugged, 1st the valve shall be tested in closed position. Raise the hydrostatic pressure continuously and gradually. The test pressure shall be held for at least 2 min. The test shall be then repeated with the valve in open position and with the outlet sealed.

8.1.1 *Requirement*

8.1.1.1 The valve shall withstand the test without permanent deformation, rupture or leak.

8.1.1.2 Valve shall satisfy pneumatic test as specified in **8.2**.

8.2 Pneumatic Test (Test Nos. 2, 5, 8, 11, 12, 13, 17, 18, 19, 22 and 24)

Each assembled valve along with poppet valve shall be subjected to pneumatic proof test at pressure specified in Table 4 and tightness shall be determined in accordance with the following procedure on each valve (test period 30 s).

The valve shall be considered leak tight, if the leakage rate does not exceed 4 Nmm^3/s (the symbol 'N' indicates conversion to normal temperature, pressure condition. NTP that is 760 mm Hg pressure at 0°c (temperature).

Table 3 Valve Test Requirement

(*Clause* 8)

Sl No.	Test No.	Test Detail	Ref to Clause	Condition of Test Valve / Test Sequence	Temperature at which the Test is Performed °C	Valve Sample No.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	1	Hydraulic pressure	8.1	As received	Room temperature	1
ii)	2	External and internal tightness	8.2	From test No. 1	Room temperature	1
iii)	3	Valve closure	8.3	From test No. 2	Room temperature	1
iv)	4	Valve stem	8.4	As received	Room temperature	2
v)	5	External and internal tightness	8.2	From test No. 4	Room temperature	2
vi)	6	Handwheel fire exposure	8.5	As received	—	3
vii)	7	Impact	8.6	As received	Room temperature	4
viii)	8	External and internal tightness	8.2	From test No. 7	Room temperature	4
ix)	9	Resistance to excessive closing torque	8.7	As received	Room temperature	5 and 6
x)	10	Resistance to excessive opening torque	8.8	As received	Room temperature	7 and 8
xi)	11	External tightness	8.9	From test No. 9 From test No. 10	Room temperature	5 and 6, 7 and 8
xii)	12	External and internal tightness	8.2	As received	Room temperature	9 to 13
xiii)	13	External and internal tightness after ageing	8.10	From test No. 12	Room temperature	9 to 13
xiv)	14	Safety relief valve working	8.11	From test No. 13	Room temperature	9 to 13
xv)	15	SRV flow capacity test	8.12	From test No. 14	Room temperature	9 to 10
xvi)	16	Cycle test Part 1 Cycle test Part 2	8.13	As received	Room temperature	14 and 15
xvii)	17	External and internal tightness test	8.2	From test No. 16	Room temperature	14 and 15
xviii)	18	External and internal tightness high temperature	8.14	From test No. 17	$65^{+2.5}_{-2.5}$	14 and 15
xix)	19	External and internal tightness low temperature	8.15	From test No. 18	-20^{+0}_{-5}	14 and 15
xx)	20	Examination of dismantled valves	8.16	From test No. 19	Room temperature	14 and 15
xxi)	21	Vibration test	8.17	As received	Room temperature	16
xxii)	22	External and internal leak test	8.2	From test No. 21	Room temperature	16
xxiii)	23	Corrosion test	8.18	As received	27 ± 2	17
xxiv)	24	External and internal tightness test	8.2	From test No. 23	Room temperature	17
xxv)	25	Excess flow device working	8.19	As received	Room temperature	18
xxvi)	26	Performance test	8.20	As received	Room temperature	19
xxvii)	27	Filling trial	8.21	As received	Room temperature	20

Table 4 Test Pressure

(*Clause* 8.2)

Sl No.	Test Pressure
i)	0.009 8 Mpa (0.1 kgf/cm²)
ii)	1.67 Mpa (17.0 kgf/cm²)

8.2.1 a) Apply specified pressure to the opened valve.

b) Then submerged the valve in water to detect leakage of poppet valve in closed position.

c) Fit blanked connector at the outlet so as poppet valve remains open.

d) Then again submerged the valve in water to detect external leakage (Gland leak, body leak, leakage at the joint of adopter and leakage at connector joint).

e) Close the valve under pressure, the torque shall not exceed 3 Nm.

f) Depressurise the outlet.

g) Then again submerged the valve in water to detect internal leakage (Seat leakage).

h) Depressurise the valve.

NOTE — Other an equivalent leak detection system shall also be permitted.

8.3 Valve Closure Test (Test No. 3)

The valve shall be such that there is metal to metal contact between the valve body and the operating mechanism with sealing element removed. There shall be sufficient travel distance for operating mechanism. So that the seal housing makes contact with the seat.

8.4 Valve Stem Over Torquing Deformation Test

8.4.1 The body shall be fitted in mild cylinder opening with matching threads.

8.4.2 All stem thread types shall withstand a torque of 1.5 times the manufacture's recommended fitting torque or the torque as shown in Table 5, whichever is greater. Taper threaded joints shall be assembled without sealant.

Table 5 Minimum Required Torque

(*Clause* 8.4.2)

Sl No.	Valve Stem Major Diameter Large End mm	Torque Nm
(1)	(2)	(3)
i)	> 19.8 < 28.8	200
ii)	≥ 28.8	250

8.4.3 The valve shall not be damaged so as to affect its performance operating mechanism shall be free and shall meet the pneumatic soundness test (*see* **8.2**).

8.5 Handwheel Fire Exposure Test (Test No. 6)

8.5.1 The handwheel shall be exposed for 1 min to a gas torch flame of 150 mm length, without an additional air supply such that the flame reaches a temperature of 800°C to 1 000°C. The handwheel shall be completely enveloped by flame.

8.5.2 *Requirement*

The valve shall be capable of being closed manually after cooling.

8.6 Impact Test (Test No. 7)

8.6.1 A valve, which is designed to be used only on cylinders protected by a protection ring, shall be submitted to an impact test of 40 J.

8.6.2 *Procedure*

a) The assembled valve, with the sealing mechanism closed, shall be firmly screwed into a cylinder opening or similar fixture.

b) A weight shall be dropped from a height so as to deliver an impact at a minimum velocity of 3 m/s. This shall be achieved by mounting the weight in a pendulum or by allowing it to fall vertically.

c) The point of impact of the weight shall be hardened steel ball of 13 mm diameter

d) The point of impact shall be approximately two-thirds the distance from the just exposed stem thread to the top of the valve body.

e) The impact shall be normal to the centre line of the valve and not cushioned by protrusions.

8.6.3 *Requirement*

The valve shall not crack or shear to such an extent the valve shall remain leak tight as tested in accordance with **8.2**.

8.7 Resistance to Excessive Closing Torque Test (Test No. 9)

The intention of the test is to ensure that the valve can withstand, without damage the minimum torque value of 20 Nm, Closing torque the testing shall be carried out without internal pressure on the valve.

8.7.1 The torque shall gradually be increased up to the value of 20 Nm, the valve shall be able to work without noticeable difficulties and shall not show any significant damage. For subsequent operation after 20 Nm is reached, the valve shall not required an operating torque greater than 3 Nm The external leak tightness of the valve shall be maintained Test No. 11 (*see* **8.9**).

8.8 Resistance to Excessive Opening Torque Test (Test No. 10)

a) The intention of the test is to ensure that the valve can withstand without damage, the minimum opening torque value of 22 Nm.
b) The opening torque shall be carried out without internal pressure on the valve.
c) The torque shall gradually be increased up to the value of 22 Nm.

8.8.1 *Requirement*

The valve shall be able to work without noticeable difficulties and shall not show any significant damage.

a) For subsequent operation after 22 Nm is reached the valve shall not require an operating torque greater than 3 Nm.
b) The external leak tightness of the valve shall be maintained Test No – 11 (*see* **8.9**)

8.9 External Tightness Tests (Test No. 11)

If the result of Tests No. 9 and 10 are satisfactory valve nos. 5, 6, 7 and 8 shall be subjected to this test as per **8.2** for external tightness test.

8.10 External and Internal Tightness Tests after Ageing (Test No. 13)

If Test No. 12 is satisfactory valve number 9 to 13 shall be subjected to on ageing process at 65 ± 5°C for a period of 5 days. After that valves are tested for external and internal tightness test as per **8.2**.

8.11 Performance Test of Safety Relief Valve (Test No. 14)

Safety relief valve shall be adjusted at nominal set pressure as agreed to between the purchaser and the manufacturer.

8.11.1 Start to discharge pressure at which the first bubble appears through a water seal of not over 100 mm on the outlet of the pressure relief valve shall be within ±5 percent of nominal set pressure or as per customer requirement.

8.11.2 The resealing pressure or the pressure at which the leakage ceases through the water seal on the outlet of the pressure relief valve shall be not less than 90 percent of the initially observed start to discharge pressure or as per customer requirement.

8.12 Safety Relief Valve Flow Capacity Test (Test No. 15)

8.12.1 A flow capacity test of a pressure relief valve shall be conducted at flow rating pressure of 120 percent of the maximum set pressure. The minimum rated flow capacity for safety relief valve shall be:

$$Q = 0.002\,74\,PW$$

where

Q = rated flow capacity of free air, in m^3/min.
P = flow rating pressure absolute, in kgf/cm^2.
W = water capacity of the cylinder, in litres.

8.12.2 Rechecking start to discharge and resealing pressure relief valve subsequent to flow capacity test. The start to discharge pressure relief valve shall be not less than 85 percent and the resealing pressure shall be not less than 80 percent of the initial start to discharge and resealing pressure recorded under above test.

NOTE — These shall be conducted approximately 1 h after the capacity test.

8.13 Cycle Test (Test No. 16)

8.13.1 The test shall be in two parts. The following procedure shall be applicable to both parts:

a) At rate not greater than 10 cycles/ minute.
b) Internal pressure – 1.2 Mpa : After each closer the pressure downstream of the valve seat shall be released to the atmosphere.
c) Opening ¾ of total stroke : Closing torque – 3 Nm
d) Opening time - 6 s
e) Closed time – 6 s : Test medium air or nitrogen

NOTES

1 The Part 1 test shall consist of 10 000 cycles (Openings/ Closings) without load on the hand wheel.

2 The Part 2 test shall consist of 3 000 (Openings/Closings) with a load of 200 N applied vertically on the hand wheel for the duration of the test.

8.13.2 *Requirement*

After the test a valve shall, meet the requirement of **8.2**.

8.14 External and Internal Tightness Test – High Temperature (Test No. 18)

If test number 17 is satisfactory, valve number 14 and 15 shall be subjected to this test in accordance with **8.2** accept that the temperature shall be 65°C.

8.15 External and Internal Tightness Test – Low Temperature (Test No. 19)

If Test no. 18 is satisfactory, valve numbers 14 and 15 shall be subjected to this test in accordance with **8.2** except that the temperature shall be -20$^{+0}_{-5}$°C.

8.16 Examination of Dismantled Valves (Test No. 20)

8.16.1 *Procedure*

If the results of Tests No. 16 to 19 on valves numbers 14 and 15 are satisfactory valves shall be dismantled and examined for deformation, wear or cracks.

8.16.2 *Requirement*

Any failure, deformation, excessive wear or cracks that after the normal operation of the valve shall be a cause of rejection.

8.17 Vibration Test (Test No. 21)

8.17.1 *Procedure*

Valve No. 16 shall be vibrated for 2 h in a test apparatus at 17 Hz with amplitude of 1.5 mm in each of the three directions (90° towards each other).

8.17.2 *Requirement*

On completion of this total 6 h of vibration, the valve shall comply with the requirement (*see* **8.2**), EFD working moreover, any part of the valve shall not become loose.

8.18 Corrosion Resistance Test (Test No. 23)

8.18.1 *Procedure*

Valve No. 17 shall be subjected to 50 h salt spray test according to IS 10250 with all connections closed.

8.18.2 *Requirement*

After the corrosion test valve shall comply external and internal leakage test as per **8.2**.

8.19 Excess Flow Device (Flow Limiter) (Test No. 25) (Valve No. 18)

8.19.1 *Procedure*

The test with water shall be conducted using an appropriately designed and calibrated liquid flow meter installed in a piping system having sufficient pressure to provide the required flow. Prior to the test air shall be eliminated from the system. The test shall be conducted by slowly increase the flow until the excess flow valve closes, just before the instance of closing, the rate of flow shall be recorded.

8.19.2 *Requirement*

8.19.2.1 Excess flow valve shall operate at a flow rate of not more than 10 percent above, nor less than 20 percent below the rated closing flow capacity specified and it shall close automatically at pressure across the valve of not more than 0.14 MPa.

8.19.2.2 *Residual leak*

When the excess flow check valve is in cut-off position, the liquid flow through the equalizing device shall not exceed 500 cm^3/min at differential pressure of 0.7 MPa.

8.20 Performance Test (Test No. 26) (Valve No. 19)

Minimum withdrawal of liquid from cylinder through a liquid off take valve shall be tested at different cylinder pressure reducing from 8 kgf/cm^2, 6 kgf/cm^2, 4 kgf/cm^2 and 1.5 kgf/cm^2.

8.20.1 *Requirement*

Rate of withdrawal per minute shall be as per customer requirement or as per manufacturer's declaration.

8.21 Filling Trial (Test No. 27)

Valve No. 20 shall be subjected to filling test at different differential pressure 7 kgf/cm^2, 3.5 kgf/cm^2, 1.7 kgf/cm^2 and 0.7 kgf/cm^2 across the valve.

8.21.1 *Requirement*

Rate of filling at different differential pressures shall be as per customer requirement or as per manufacturer's declaration.

8.22 Acceptance Criteria

The failure to meet any of these test requirements shall be a cause for rejection of the valve design.

9 DOCUMENTATION/TEST REPORT

9.1 The following documents shall be available.

a) A set of drawings consisting of the general arrangements, parts list, specification for metallic and non-metallic material and detail drawings.
b) Description of valve and method of operation.
c) Information on the intended use of the valve (for example LPG mixture, pressures, temperatures, connection use with or without protection cap or protection ring).
d) Certificate relating to material suitability and compatibility with LPG.

9.2 Test Report

A written report shall be prepared detailing the tests carried out and the results from each test

10 MARKING

10.1 Each valve shall be permanently marked with the following information:

a) Month and year of manufacture;
b) Manufacturer's identification mark;
c) Number of this specification;
d) Maximum working pressure, in Mpa;
e) Batch No. of the valve body material;
f) Safety relief valve capacity, in m^3/min;
g) Nominal set pressure of safety relief valve; and
h) PESO's approval number.

10.2 BIS Certification Marking

The valve may be marked with the Standard mark.

10.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standard Act,* 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to manufactures or producers may be obtained from the Bureau of Indian Standards.

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
319 : 2007	Free cutting leaded brass bars, rods and sections—specification
1598 : 1977	Methods for izod impact test metals
1608 : 2005	Methods of tensile testing of metals
2102 (Part 1) : 1993	General tolerances: Part 1 Tolerances for linear and angular dimensions without individual tolerance indications
2305 : 1988	Method for mercurous nitrate test for copper and copper alloys
3400 (Part 1) : 2012	Methods of test for vulcanized rubber: Part 1 Tensile stress-strain properties
3400 (Part 2) : 2003	Methods of test for vulcanized rubber : Part 2 : Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)
3400 (Part 4) : 2012	Methods of test for vulcanized rubbers — Part 4 Accelerated ageing and heat resistance
3400 (Part 10): 1977	Method of test for vulcanized rubbers — Part 10 : Compression set at constant strain
3400 (Part 20) : 1994	Methods of test for vulcanized rubbers — Part 20 : Resistance to ozone cracking — Static strain test
4454 (Part 4): 2001	Stainless steel spring wire for normal corrosion resistance
4905 : 1968	Method of random sampling
5903 : 1970	Recommendations for safety devices for gas cylinders
6912 : 2005	Copper and copper alloys forging stocks and forgings
7202 : 1974	Inspection gauges for checking threads of gas cylinders valve for use with breathing apparatus
8737 : 1995	Valve fittings for use with liquefied petroleum gas (LPG) cylinders of more than 5 litres capacity
9122 : 2008	Inspection gauges for checking Type 2 taper threads of gas cylinders valve, taper 3 in 25
9798 : 2013	Low pressure regulators for use with liquefied petroleum gas (LPG) mixtures
15894 : 2011	Inspection gauges for checking Type 1 (size) taper threads of gas cylinders valves, taper 1 in 16

ANNEX B

(*Clause* 4.2.4)

B-1 SCALE OF SAMPLING

B-1.1 Lot

All the valve blanks of the same material size and produced under similar conditions of manufacture shall grouped together to constitute a lot.

B-1.1.1 Valve blanks shall be selected from each lot separately and then tested, for ascertaining their conformity to the requirements of mechanical properties.

B-1.1.2 The number of valve blanks to be selected from a lot shall depend upon the size of the lot and shall be in accordance with col 1 and col 2 of Table 6. All the samples shall be taken randomly from the lot and for this purpose; reference should be made to IS 4905.

B-2 NUMBER OF TEST AND CRITERIA FOR CONFORMITY

B-2.1 All the valve blanks selected according to col 2 of Table 6 shall be divided in to two equal halves. Each of the samples in the first half shall be tested for tensile and elongation in the second half for izod impact strength.

B-2.2 The lot shall be declared as conforming to the requirements of mechanical properties, if it has been found satisfactory when tested according to **B-2.1** and found to be meeting the requirements of mechanical properties as per **4.2.2** and **4.2.3**. If any test samples fails to meet the requirements of **4.2.2** and **4.2.3**, additional specimens equaling twice the number of samples size for the failed test in the same lot shall be taken and tested for the failed test only. If any of these specimens fails to meet the requirements, the entire lot represented shall be rejected.

Table 6 Scale of Sampling

(*Clauses* A-1.1.2 *and* A-2.1)

Sl No. (1)	Number of Valve Blanks in the Lot (2)	Samples Size for Izod Impact Strength and Tensile Strength and Elongation (3)
i)	Up to 500	10
ii)	501 to 3 200	14
iii)	3 201 to 10 000	20
iv)	10 001 to 35 000	32
v)	35 001 and above	50

ANNEX C

(*Informative*)

PRODUCTION TESTING AND INSPECTION

C-1 The manufacturer should implement a conformity assessment procedure to ensure that the quality and performance of the manufactured valves comply with the quality and performance of the valves subjected to type test.

C-2 Every valve should be tested for,

a) external tightness and internal tightness;
b) safety valve working (start to leak and release pressure);
c) working of excess flow device; and
d) visual check.

C-3 Batch sample should be taken in accordance with IS 2500 (Part 1) level S4 and the following tests and inspections carried out:

a) External tightness;
b) Internal tightness;
c) Dimensional verification;
d) Material suitability;
e) Safety valve working;
f) Excess flow device working; and
g) Marking.

C-4 REJECTION CRITERIA

a) Valve not meeting the requirements of **C-2** should be rejected; and
b) Batches of valves not meeting the requirement of **C-3** should follow the rejection criteria of IS 2500 (Part 1).

C-5 DOCUMENTATION

Result of production testing should be recorded and retained.

ANNEX D

(*Clause* 4.3)

IMMERSION TEST (RESISTANCE TO HYDROCARBONS)

D-1 GENERAL

The test is designed to evaluate the rubber material, namely its resistance to hydrocarbons.

D-2 PROCEDURE

Weight the sample, W_0 prior to test. Immerse the same in pentane or test gas maintained at a temperature of 20 ± 5°C for 72 h. Remove the sample and expose it to atmosphere. After 5 min, weigh the sample W_1. Next, let it stay exposed to atmosphere for 24 h and reweigh W_2 and calculate the following:

a) Percentage of test gas absorbed

$$= \frac{W_1 - W_2}{W_0} \times 100$$

b) Percentage of matter extracted

$$= \frac{W_0 - W_2}{W_0} \times 100$$

D-3 The results of the above test shall be in accordance with as given below:

Component	*Extractables* Percent	*Absorbed* Percent
Diaphragm	10	10
Valve pad	5	10
Seal	20	20

NOTE — It is permitted to wipe clean the component after removal immersion.

ANNEX E

(*Foreword*)

COMMITTEE COMPOSITION

Gas Cylinders Sectional Committee, MED 16

Organization	*Representative*(*s*)
Petroleum and Explosive Safety Organization, Nagpur	Shri T. R. Thomas (***Chairman***) Shri Ashendra Singh (*Alternate*)
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AMENDMENT NO. 1 JANUARY 2022

TO

IS 16484 : 2017 LIQUID OFF - TAKE VALVE FITTING TO GAS CYLINDERS OR TANKS (MOBILE OR STATIC) FOR LIQUID PETROLEUM GAS (LPG) — SPECIFICATION

(*Second cover page*, *foreword, para* 2, *first sentence*) — Substitute the following for the existing:

'This standard specifies the requirements of material, design and testing of liquid off-take valve fitting to gas cylinder or tanks (mobile or static) for liquefied petroleum gas (LPG).'

(*Page* 1, *clause* **1**) — Substitute the following for the existing:

'This standard covers the specification of material, design and testing of liquid off-take valve fitting to gas cylinders or tanks (mobile or static) for liquefied petroleum gas (LPG). It covers valve with taper stems only.'

(MED 16)

Publication Unit, BIS, New Delhi, India